

2019–2020 NC Final Exam of Discrete Mathematics

North Carolina Assessment Specifications

Purposes of the Assessments

The NC Final Exam (NCFE) for Discrete Mathematics measures students' academic progress on the North Carolina [Standard Course of Study](#), adopted by the North Carolina State Board of Education (SBE) in June 2003.

NC State Board of Education policy [TEST-016](#) directs schools to use the results from all course-specific NCFEs as a minimum of 20% of the student's final course grade.

NCFEs are not used for school and district accountability under the Accountability Model or for federal reporting purposes.

Developing Assessments

North Carolina educators are recruited and trained to write new items for the NCFEs. The diversity among the item writers and their knowledge of the content standards are addressed during recruitment. Trained North Carolina educators also review items and suggest improvements, if necessary. The use of North Carolina educators to develop and review items strengthens the instructional validity of the items. Teachers interested in training to become an item writer or a reviewer for the North Carolina Testing Program can visit <https://center.ncsu.edu/ncpd/course/view.php?id=128>.

For an in-depth explanation of the test development process see SBE policy [TEST-013](#) or reference the [Test Development Process: Item, Selection, and Form Development](#).

Curriculum and Assessment Cycle

2003: North Carolina SBE adoption of the [Standard Course of Study](#).

2012–2013: Operational administration of the Measures of Student Learning: Common Exams

2013–14: Redesign and subsequent first operational administration of the NCFEs.

2014–15: Second operational administration of the NCFEs.

2015–16: Third operational administration of the NCFEs.

2016–17: Fourth operational administration of the NCFEs.

2017–18: Fifth operational administration of the NCFEs.

2018–19: Sixth operational administration of the NCFEs.

2019–20: Seventh operational administration of the NCFEs.

Prioritization of Standards

Members of the North Carolina Department of Public Instruction's (NCDPI) Test Development Section invited teachers to collaborate and develop recommendations for a prioritization of the standards indicating the relative importance of each standard, the anticipated instructional time, and the appropriateness of the standard for multiple-choice items.

Table 1 describes the percentage range of score points associated with each content category that will appear on the NCFE. The table of test specification weights describe the percent of total score points.

*Table 1. Test Specification Weights for the **Discrete Mathematics** NCFE 2003 Standard Course of Study*

Standard	Percent of Total Score Points
1.01	≈ 18%
1.02	≈ 12%
2.01	≈ 15%
2.02	≈ 24%
2.03	≈ 21%
3.01	≈ 9%
Total	100%

Cognitive Rigor

The Discrete Mathematics items were aligned to the content standards using Marzano's *Thinking Skill Levels*.

Types of Items and Supplemental Materials

The NCFEs for Advanced Functions and Modeling and Precalculus consist of four-response-option multiple-choice items.

Students must be provided a graphing calculator, a state-provided formula sheet, graph paper, and blank paper.

A complete list of the supplemental test materials (i.e., *2018–2019 NC Final Exams Materials List*) may be reviewed at the [NCDPI/Accountability Services](#) website.

Released items are available on the [NCDPI/Accountability Services](#) Website. Released items may be used by school systems to help acquaint students with items. The released items, however, may not reflect the breadth of the standards assessed and/or the range of item difficulty found on the NCFE. These materials must not be used for personal or financial gain. The released items are also available to schools through NCTest, the NCDPI's online assessment platform.

Schools must ensure every student participating in an online assessment for the North Carolina Testing Program has completed the appropriate Online Assessment Tutorial for the associated assessment(s) at least one time per year at the school before test day. The tutorial provides students the opportunity to practice the mechanics of navigating through the testing platform, to become familiar with the tools, and to respond to the sample items. Refer to the [Online and Paper/Pencil Test Administrator's Guide](#) for additional information.

Testing Structure and Test Administration Time

The Discrete Mathematics NCFE contains 37 multiple-choice items.

Included in the total item counts are embedded multiple-choice field test items that will not count toward or against a student's score. These items are examined for inclusion on future operational assessments.

NC Final Exam 2019-20	Number of Operational Items	Number of Field Test Items*	Total Number of Items
Discrete Mathematics	33 multiple-choice	4 multiple-choice	37

*Field test items will not count toward or against the student's score but will be used for purposes of developing items for future test forms.

Students will be given 120 minutes to answer all items.

Appendix A shows the number of operational items for each standard for the 2019–20 tests. Note that future coverage of standards could vary within the constraints of the test specification weights in Table 1.

Test Cycle and Delivery Mode

The NCFEs are administered to students enrolled in fall and spring courses. A list of course codes that align with the 2019–20 NCFEs (i.e., *Course Codes that Align with the NC Final Exams*) is available on the [NCDPI/Accountability Services](#) website.

The NCFEs are administered through NCTest, the NCDPI's online assessment platform. Paper editions are also available.

The NCFEs are only provided in English; translated versions are not available.

Appendix A

Discrete Mathematics NC Final Exam 2019–20 Number of Operational Items by Objective

The following table shows the number of operational items for each objective. Note that future coverage of objectives could vary within the constraints of the test specification weights in Table 1. Some objectives not designated with tested items (i.e., “–”) may be a prerequisite objective, may be tested within the context of another objective or may be included as an embedded field test item.

<u>Discrete Mathematics</u> Objective	Number of Items Operational Per Objective
Competency Goal 1: The learner will use matrices and graphs to model relationships and solve problems.	
1.01.a—Use matrices to model and solve problems. a) Display and interpret data.	3
1.01.b—Use matrices to model and solve problems. b) Write and evaluate matrix expressions to solve problems.	3
1.02—Use graph theory to model relationships and solve problems.	4
Competency Goal 2: The learner will analyze data and apply probability concepts to solve problems.	
2.01.a—Describe data to solve problems. a) Apply and compare methods of data collection.	1
2.01.b—Describe data to solve problems. b) Apply statistical principles and methods in sample surveys.	1
2.01.c—Describe data to solve problems. c) Determine measures of central tendency and spread.	1
2.01.d—Describe data to solve problems. a) Apply and compare methods of data collection.	1
2.01.e—Describe data to solve problems. e) Interpret graphical displays of data.	–
2.01.f—Describe data to solve problems. f) Compare distributions of data.	1
2.02.a—Use theoretical and experimental probability to model and solve problems. a) Use addition and multiplication principles.	2
2.02.b—Use theoretical and experimental probability to model and solve problems. b) Calculate and apply permutations and combinations.	1

2.02.c—Use theoretical and experimental probability to model and solve problems. c) Create and use simulations for probability models.	3
2.02.d—Use theoretical and experimental probability to model and solve problems. d) Find expected values and determine fairness.	—
2.02.e—Use theoretical and experimental probability to model and solve problems. e) Identify and use discrete random variables to solve problems	1
2.02.f—Use theoretical and experimental probability to model and solve problems. f) Apply the Binomial Theorem.	1
2.03.a—Model and solve problems involving fair outcomes. a) Apportionment.	3
2.03.b—Model and solve problems involving fair outcomes. b) Election Theory.	2
2.03.c—Model and solve problems involving fair outcomes. c) Voting Power.	2
2.03.d—Model and solve problems involving fair outcomes. d) Fair Division.	—
Competency Goal 3: The learner will describe and use recursively-defined relationships to solve problems.	
3.01.a—Use recursion to model and solve problems. a) Find the sum of a finite sequence.	—
3.01.b—Use recursion to model and solve problems. b) Find the sum of a finite sequence.	1
3.01.c—Use recursion to model and solve problems. c) Determine whether a given series converges or diverges.	—
3.01.d—Use recursion to model and solve problems. d) Write explicit definitions using iterative processes, including finite differences and arithmetic and geometric formulas.	2
3.01.e—Use recursion to model and solve problems. e) Verify an explicit definition with inductive proof.	—